

ART. XI. NEW AND PREVIOUSLY KNOWN MIDDLE
DEVONIAN CRINOIDS OF NEW YORK

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Through the kindness of I. G. Reimann of the Buffalo Museum of Science there have come into the hands of the writer considerable collections of crinoids from the Hamilton beds of Erie and Genesee Counties which are in the possession of the Buffalo Museum of Science and private collectors. A total of twenty-six species were identified, including 19 Camerata, 2 Flexibilia, and 5 Inadunata. Six of these species are new and new observations have been added for three forms already described.

In the collection of Percy R. Powell of Niagara Falls, N. Y., there are a number of unidentifiable specimens of *Acanthocrinus*, possibly a new species, from the Onondaga limestone near Buffalo City Hospital. In the Federal Crushed Stone Quarry, Cheektawaga, Erie County, N. Y., six miles east of Buffalo, A. L. Carter of Kenmore, N. Y. collected from the Onondaga limestone four specimens identified as *Lasiocrinus* sp., probably new but too poorly preserved to warrant description. Dr. Edwin Kirk (Proc. U. S. Nat. Mus., vol. 46, p. 482, 1914), in a paper on the genus *Homocrinus*, has called attention to the occurrence of a species of *Lasiocrinus* in the Onondaga of New York.

Order **CAMERATA** Wachsmuth and Springer

Rhodocrinus insculptus sp. nov.

(Plate XXV, figure 1)

Only one Devonian species of *Rhodocrinus* has been previously described, *R. nodulosus* Hall with the var. *pernodosus* Goldring (Hall: 15th Rept. N. Y. State Cab. Nat. Hist., p. 126, 1862; Goldring: N. Y. State Mus. Mem. 16, p. 89, pl. 2, figs. 1-6, 1923). This new species, of comparatively small size, is represented by a single, partially preserved, dorsal cup, readily recognized and quite distinct from *R. nodulosus* or its variety.

Dorsal cup, even allowing for some crushing, low and turbinate, widening rapidly to the secundibrachs; width greater than height; interradiial and intersecundibrach areas depressed.

Infrabasals small, only one preserved, loose. Basals five, heptagonal, larger than any of the other plates, slightly longer than wide. Radials slightly smaller than the basals, the two posterior ones hexagonal, the others pentagonal. Primibrachs two, smaller than the radials, the first hexagonal, wider than high; primaxils pentagonal, wider than high. In the left posterior and right anterolateral rays the left half ray branches on the second secundibrach; the right half ray on the third in the right anterolateral ray; not shown in other rays. Only the first, fairly large intersecundibrach shown. Primary interbrachial in the regular interradii smaller than the radials, followed by two, three, and three plates. Anal interradius showing median line of plates, the first or anal, larger than the radials; followed by three plates in the second series, apparently five in the third.

Tegmen, arms, column not known.

Ornamentation: A strong broad ridge follows each radial series up onto the secundibrachs making the interradiial and intersecundibrach areas appear depressed. Plates of interradiial area ornamented with comparatively prominent radiating ridges, also seen at the edges of the radials and primibrachs. Basals at lower edge marked with an insignificant, low node.

Holotype in the collection of Percy R. Powell of Niagara Falls, N. Y.

Horizon and locality: From the Hamilton (Tichenor or Moscow) beds in a railroad cut, two miles east of Alden, Genesee County, N. Y.

Remarks: The prominent radial ridges and the radiating ridges on the plates of the interradiial series readily distinguish this species, which derives its name *insculptus* (engraved) from the character of the ornamentation.

Gilbertsocrinus spinonodosus sp. nov.

(Plate XXVI, figures 2-4)

This species is represented by a single calyx, somewhat collapsed but very distinctive in character. No accurate measurements of the dorsal cup can be made. The tegmen has diameters of 18 mm. to 19.4 mm.

Dorsal cup apparently depressed subglobose, somewhat constricted

at the arm bases and probably wider than high. Basal cavity wide and apparently deep, the basals and the lowest portion of the radials forming the sides. Radials are the largest plates in the dorsal cup; primaxils very little smaller than the first primibrachs. Primary interbrachials smaller than the radials but larger than the first primibrachs, followed in the regular interradii by three plates in the second row, usually three in the third (four in right anterior interradius), in the anal interradius by three in the second, five in the third. Due to the collapsed condition of the calyx, just beneath the arm bases, the higher ranks of plates cannot be studied. Only the first secundibrachs can be distinguished.

Tegmen roughly pentagonal in outline, low, almost flat, and marked with a series of ridges and depressions. Plates highly convex, almost nodose in places, and large; those forming the interradiial depressions somewhat smaller, orals a little larger. Interradiial depressions five in number, the posterior one at least twice as large as the others with the anal opening occupying the inner end. Smaller depressions paved by a few large plates of irregular form; more numerous and smaller plates in the anal depression, smaller in the vicinity of the anus.

Nothing is known of the *column*. It has not been possible to remove the filling from the basal cavity.

Ornamentation very characteristic. Spines on the radials broken but shown by the stumps to be very stout. Spinose nodes or tubercles borne by the first primibrachs, and conspicuous tubercles on the primaxils. A strong and rather sharp tubercle, not as conspicuous as on the first primibrachs, is borne by the primary interbrachial, in the anal interradius. This tubercle has been broken away in the other interradii, and judging by the stump in the left anterior interradius may have been there almost a small spine. All the plates of the interradii bear comparatively strong nodes or tubercles, stronger in the anal interradius. Low ridges radiate from center to center of the plates, particularly in the interradii, but are somewhat masked by the prominence of the nodes as is also the low ridge traversing the radial series. Some of the plates of the tegmen also nodose.

Holotype in the collection of the Buffalo Museum of Natural Science. Collector E. Reinhard.

Horizon and locality: From the Hamilton beds (Ludlowville: Tichenor limestone), Eighteen Mile Creek, Erie County, N. Y.

Remarks: Three species of *Gilbertsocrinus* have already been

described from the Hamilton beds of New York State: *G. spinigerus* from the Moscow shale, first described by Hall (15th Ann. Rept. N. Y. State Cab. Nat. Hist., p. 128, 1862) and more recently re-described and figured by the writer (N. Y. State Mus. Mem. 16, p. 96, pl. 3, figures 1-6, 1923), and *G. intersculptus* and *G. rarispinus* from the Skaneateles and Moscow shales, respectively, soon to appear in a paper by the writer (A New Collection of Hamilton Crinoids from New York). Two other Hamilton species have been described: *G. greenei* from Clark County, Indiana (Miller & Gurley: Bull. Ill. State Mus., pp. 35, 40, pl. 3, fig. 13-15, 1895) and *G. alpenensis* from Alpena, Michigan (G. M. Ehlers: Contr. Mus. Geol. Univ. Mich., vol. 2, p. 99, pl. 1, figs. 1, 2, 1925). *G. indianensis* M. & G. (ref. cit. p. 38) has been shown by the writer to be a synonym of *spinigerus* (ref. cit. p. 98). *G. spinigerus* has spines on the radials, first primibrachs and primary interbranchials; *greenei* differs from it in having no spine on the first primibrachs; *alpenensis* differs in having no spine on the primary interbranchials; *intersculptus* has prominent spines on the radials and first primibrachs and none on the primary interbranchials, but is further characterized by distinct radiating ridges on radials and interradials and six arms to the ray instead of four as in the preceding species; *rarispinus* has prominent spines on the radials only.

G. spinonodosus derives its name from the heavy spines on the radials and heavy nodes or tubercles on the other plates of the dorsal cup. These characters, with the associated radiating ridges, the shape of the dorsal cup, and the character of the tegmen, make this species quite distinct from all the others.

Gilbertsocrinus multicalcaratus sp. nov.

(Plate XXVI, figures 5, 6)

This is the largest species of Devonian *Gilbertsocrinus* yet collected, dwarfing all the other forms, even *G. intersculptus*, the largest so far described, with a height to the arm bases of 14 mm. and a greatest width at the first primibrachs of 19 mm. The species is based upon a single, crushed specimen, but it is such a striking form that there could be no difficulty in identifying it.

Dorsal cup uncrushed would probably have about the same shape as that of *spinigerus*, narrowing toward the arm bases, pentagonal in cross-section. It is constricted below the arm bases, but preserved no

higher than the first secundibrach. Height from rim of basal depression to top of first secundibrachs 21 mm. Width at this height (crushed) 19 mm.; width at top of radials (crushed) 30 mm. With the same proportions as *spinigerus* the estimated width at the radials would be about 33 mm.; at the first secundibrachs, about 22 mm. All plates heavy.

Radials are the largest plates in the cup; first primibrachs higher but narrower, considerably larger than the primaxils. All interradii are considerably crushed except the anal which is preserved by the strong spine on the primary interbrachial. Primary interbrachial slightly smaller than the radials, followed by the series 3, 3, 3, 3 in the anal interradius and with a distinct median line of plates. Primary interbrachials crushed in the regular interradii, supporting the series 3, 3, 3, 2 where the plates can be distinguished.

Tegmen: No part of the tegmen preserved indicating that it was composed of rather thin plates.

Column: Round, of medium size.

Ornamentation: Striking, but not elaborate. Stumps of stout spines shown on the radials and first primibrachs and the primary anal plate. A low ridge follows the radial series up onto the secundibrachs, and coarse radiating ridges are seen on the radials. Plates smooth except that the higher ranges of plates in the anal interradius show very faint ridges extending from center to center.

Holotype in the collection of Percy R. Powell, of Niagara Falls, N. Y.

Horizon and locality: From the Hamilton (Moscow shale: Kashong) beds at East Bethany, Genesee County, N. Y.

Remarks: See *Remarks* under *G. spinonodosus*. The size and shape of the dorsal cup, the size and arrangement of the spines and the general character of the plates of the cup will readily distinguish this species. The name, *multicalcaratus* (many spurred), is derived from the many stout spines.

Melocrinus gracilis Wachsmuth and Springer

(Plate XXV, figure 2)

1897. *Melocrinus gracilis* Wachsmuth & Springer. N. Amer. Crin. Cam., 1: 298; pl. 22, fig. 5 (author's ed.); Mem. Mus. Comp. Zool., V. 20.

1903. *Melocrinus gracilis* Clarke & Ruedemann. N. Y. State Mus. Bull. 65, p. 74.

1904. *Melocrinus gracilis* Clarke & Luther. N. Y. State Mus. Bull. 63, p. 52.

1923. *Melocrinus gracilis* Goldring. N. Y. State Mus. Mem. XVI, p. 136, pl. 13, fig. 6.

The holotype in the New York State Museum is a medium sized calyx in a rather crushed condition. It does not show the anal interradius; and only the first three ossicles of one arm trunk are shown.

A specimen loaned by Irving G. Reimann from the collection of the Buffalo Museum of Science shows a fairly complete *dorsal cup*. Un-crushed cup with a height of 13 mm., practically that of the holotype, and a width at the arm bases of 18.3 mm. to 20.4 mm. Pyramidal shape well shown as well as the pentagonal cross-section due to the conspicuous ridges which extend up the radial series and the depressed interbrachial areas.

In the regular interradii the hexagonal primary interbrachial is followed by two plates in the second row, three in the third, usually four in the fourth, etc., merging insensibly with the tegmen plates. In the anal interradius the primary interbrachial is heptagonal, and the succession is 1, 3, 4, 6, 7 or 8, merging into the many small plates of the tegmen.

A very small intersecundibrach, separating the first secundibrachs only, is well shown in four rays.

Tegmen: Lower plates of the tegmen shown only in two regular interradii and anal interradius, and are as described for the type except that no tubercle was observed at the center of any of them.

Arms, missing entirely in the holotype, are partially preserved in this specimen in two rays, 22 mm. of the main trunk in one and portions of about the same length in another. In the left posterior ray five ossicles of the auxiliary arm are shown, the first two quadrangular and the other three slightly wedge-shaped; in the left anterolateral ray the auxiliary arm is preserved to a length of four ossicles. The main trunk is deeply grooved on the dorsal side and composed of short ossicles, three in 2 mm. The first arm is borne by the sixth ossicle of the main trunk. A break obscures the origin of the second which appears however to have been attached to the ninth. Stumps of spines are shown on the twelfth pair of ossicles in both arm trunks, and in one, again on the ninth pair beyond. In the left anterolateral ray the main trunk preserves parts of two uniserial arms with quadrangular brachials which bear on the dorsal side, at long intervals (10 or 12 ossicles so far as preserved), small spines or spinose tubercles. A few pinnules are poorly preserved; they are slender and may be angular.

Column: The column is not present; and a portion of the basal ring is missing.

Ornamentation: There is little to add in the matter of ornamentation. All ossicles of arm trunks, arms, and auxiliary arms have finely crenulate edges. In the dorsal cup the plates of the radial series show finely crenulate edges, and some of the plates of the interradii show this character distinctly. In the description of the holotype this feature was not noted, but re-study shows the presence of crenulate edges on some of both radial and interradiial plates, particularly well shown on the secundibrachs. The tegminal plates of the holotype and the lower tegminal plates of this specimen do not show this fine crenulation, but it may be present and only obscured. The specimen under discussion shows slight pittings at the angles of the plates of the dorsal cup, less conspicuous, however, than in the holotype. A slight depression is present at the center of the plates of the interradii and these and the radial plates show flattened margins, slightly raised in places, a feature only suggested in the holotype and probably developed with the thickening of the plates. Inconspicuous tubercles are present on the primaxils and suggested on one of the first primibrachs; they are not present on the first secundibrachs as in the holotype.

Horizon and locality: The holotype is from the Hamilton (Moscow shale) beds, Canandaigua Lake, N. Y.; the specimen owned by the Buffalo Museum of Science was collected by Irving G. Reimann from the Moscow (Kashong) at East Bethany, Genesee County, N. Y.

***Melocrinus powelli* sp. nov.**

(Plate XXV, figures 3, 4; plate XXVI, figure 1)

Melocrinus sp. nov. Goldring. N. Y. State Mus. Mem. 16, p. 142, pl. 15, fig. 8, 1923.

A column of this species was described and figured by the writer as *Melocrinus* sp. nov. It was found occurring on the same slab with a tubular appendage ornamented with spines on the main trunk and uniserial arms. The ossicles composing the main trunk, and the brachials of the uniserial arms as well, show edges as markedly crenulate as those of the columnals of the associated stem, hence they were provisionally referred to the same species, a designation strengthened by the fact that the same type of column was found on two other slabs from the same locality associated with small arm fragments of the same type.

In a collection of Devonian crinoids loaned by Percy R. Powell of Niagara Falls, N. Y., is a column of this species attached to a poorly preserved dorsal cup and a fairly complete tegmen from the same locality, believed to belong to the same species.

Dorsal cup is of moderately large size with a height to the arm bases of 20.7 mm. No measurements of width can be made because of the crushed condition of the cup, which appears to have been pyramidal with a broadly pentagonal cross-section due to low ridges on the radial series and depressed interradial areas. Basals forming a low cup, each basal about three times as wide as high and projecting somewhat beyond the column at the lower edge. Radials large, hexagonal, wider than high, the lower lateral faces being the longer. Typical plate with a width of 6.2 mm. and a height of 4.3 mm. There is a gradual decrease in size in the radial plates though both the first primibrachs and primaxils are still of good size, the former hexagonal, the latter pentagonal and bearing 2 x 5 secundibrachs. A typical primibrach is 5.4 mm. wide and 4.4 mm. high; a typical primaxil has a width of 4.5 mm. and a height of 4.2 mm. Secundibrachs shown only in two rays. First secundibrachs large, hexagonal, one plate measuring 4.2 mm. in width and 3.3 mm. in height. Only secundaxil shown hexagonal in shape, with a width of 4.2 mm., a height on the inside of 1.5 mm., on the outside of 2.2 mm.; bearing on the upper inner face the first plate of half the tubular arm, on the upper outer face the first plate of an auxiliary arm. There is no intersecundibrach; first secundibrachs and secundaxils of each half ray join in the median line with crenulated sutures.

Parts of two regular interradia are shown. Primary interbrachial smaller than the primibrachs, hexagonal, and followed by two plates in the second row, three in the third, and apparently four in the fourth.

Tegmen: Only a few plates of the tegmen are preserved with the dorsal cup but there is an indication that it is highly arched. The separate tegmen found at the same locality has been provisionally referred to this species because an elevated tegmen has been suggested by the other specimen and in one radius an arm base is preserved which resembles that of this species in the shape and size of the secundibrachs, the absence of an intersecundibrach, the presence of an auxiliary arm and the strong crenulation of all the plates. Strong crenulation of all the tegmental plates is another feature linking the two specimens. Tegmen highly arched as in *M. gracilis*, 21.1 mm. high,

and composed of numerous small plates, somewhat elevated at the apex and in line with what is considered the anal interradius where they are also noticeably larger.

Arms: Little of the arms is preserved in the two specimens under discussion. With the tegmen in one ray are preserved five quadrangular plates of the auxiliary arm. Dorsal cup in one ray preserves 11 ossicles (10.3 mm.) of half of a tubular arm which appears to be deeply grooved dorsally. A uniserial arm with quadrangular brachials is borne by the sixth and again by the tenth ossicle, the arm-bearing brachials being longer than the others. All arm plates are strongly crenulate. So far as preserved this arm resembles the arm trunk originally linked with the column of this species (ref. cit.) and which may still be considered as belonging to it. This tubular arm, preserved for 100 mm., and even then incomplete, is deeply grooved on the dorsal side and very flexible. Double rows of ossicles short and broad with strongly crenulate edges. Uniserial arms given off on each side from every third ossicle (fourth in one place), which in every case is longer than the others. Brachials quadrangular, broader than long, with crenulate edges; each bearing a pair of long, delicate pinnules, composed of long pinnulars with a dorsal carina which gives them an angular appearance. Strong spines on both the main trunk and the arms; on the main trunk borne in each half, usually by every ninth ossicle, with intermediate arm-bearing ossicles sometimes showing a faint tubercle. Spines not paired, of each two the one on the left side is borne by the third ossicle above the one on the right side. First spine on the right side on the twelfth ossicle above the secundaxil. Spines on arms irregularly spaced, closer together nearer the extremities; intermediate brachials in places show small tubercles. Auxiliary arm borne by the secundaxil showing five quadrangular plates with crenulate edges.

Column very striking and preserved to a length of about 15 cm.; composed of nodes and internodes. There are two sizes of nodals, the larger ones projecting considerably and ornamented with strongly developed nodes or tubercles which give an almost spinose appearance to the nodals. Midway between the heavier nodals are minor ones that project slightly and have a knifelike edge. Internodals very short; in the lower portion of the column three between each minor nodal and the large nodal above and below, the middle one of the three being noticeably longer. In the upper portion of the column usually only two internodals between the minor and heavy nodals; for

about 35 mm. below the dorsal cup usually only one. Edges of all columnals strongly crenulate.

Ornamentation consists largely of the spines and tubercles on the arms and column, the low radial ridges and the crenulate edges of all plates. There is a suggestion of a granulose surface on a few of the plates of the dorsal cup, though most of them appear quite smooth. One of the few scattered tegminal plates has a tiny central tubercle.

Horizon and locality: The original types are from the Hamilton (Moscow shale) beds, Cashong Creek, Bellona, N. Y. The two specimens in the Powell collection are also from the Moscow shale, Bowen Creek, Genesee County, N. Y.

Remarks: The tegmen and arm trunk referred to this species bears a strong resemblance to that of *M. gracilis*. The tegminal plates, however, in general show no central tubercles and the spines on the arm trunk have a different arrangement. Dorsal cup in this species broader, with less prominent radial ridges; plates proportionately larger and showing no tubercles. Columns in the two forms are quite distinct. Column of *powelli* strongly resembles that of *M. naplesensis* from the Portage beds, but there is no resemblance otherwise between the two species.

The species has been named in honor of Percy R. Powell from whose collection the two Bowen Creek specimens were obtained for study.

Gennaeocrinus similis sp. nov.

(Plate XXVI, figures 7, 8)

Though represented by a single, partially preserved cup, there are enough distinctive characters shown in the specimen to assure identification of more complete material.

Dorsal cup of medium size and probably would be somewhat narrowly bowl-shaped. Three equal basals thickened and projecting in a trilobate rim. Radials hexagonal or heptagonal, slightly wider than high. Primibrachs hexagonal, shorter and less wide than the radials. Nothing preserved above this. Primary interbrachial hexagonal, larger than the first primibrachs, followed by two plates. First anal plate, heptagonal, larger than the radials, followed by three large plates in the second row.

Column round, apparently with a pentalobate axial canal.

Ornamentation quite characteristic. The entire surface, so far as

preserved is finely reticulate, a character particularly well shown in the anal interradius. Each projecting basal with edge prolonged into three more or less sharp points or tubercles, roughly marking the terminations of the ridges from the centers of the radials and first anal to the basals. A continuous ridge traverses the plates of the radial series, rising into low nodes at the centers of the radials and apparently of the first primibrachs also. Strong ridges extend from center to center of radials and first anal and from these centers also to the three upper faces of each basal roughly terminating in the tubercles mentioned above. With this arrangement two ridges extend to each of two basals from the first anal and the right and left anterolateral radials. The ridges in the anal interradius are stronger and also the central node on the first anal. Faint ridges extend from the first anal to the small nodes at the centers of the three plates in the series above. Each primary interbrachial shows a fairly prominent central node, incipient ridges on the lower part of the plate and granules, which are likewise sparsely scattered over the other plates. Seen from the base the ridges, extending from center to center of radials and first anal, form a prominent six-sided figure.

Holotype in the collection of Percy R. Powell of Niagara Falls, N. Y.

Horizon and locality: From the Hamilton (lower Moscow?) beds in the railroad cut two miles east of Alden, Genesee County, N. Y.

Remarks: The ornamentation of this species is very similar to that of *G. peculiaris* Goldring, also from the Moscow shale, hence the name. *G. similis* is readily distinguished by the projecting radials each with three sharp points or tubercles, the arrangement of the ridges, the reticulate character of the surface of the plates, and the absence of the prominent concave-faced, three-sided pyramids formed by the radiating ridges on the radials and first anal of *G. peculiaris*.

Cyttarocrinus jewetti Goldring

(Plate XXVII, figures 1, 2)

1872. *Platycrinus eboraceus* (in err.) Hall. N. Y. State Mus. Bull. 1, pl. 1, figs. 16, 17.

1923. *Cyttarocrinus* (?) *jewetti* Goldring. N. Y. State Mus. Mem. XVI, pp. 271-273, pl. 36, figs. 3-5.

This species was based upon a badly crushed dorsal cup, and was provisionally placed in the genus *Cyttarocrinus* with *C. eriensis* (Hall)

because the tegmen and arms were unknown. The writer has recently had for study two uncrushed cups from the collection of Percy R. Powell of Niagara Falls, N. Y., and was able to work out the arms in two rays of the larger specimen.

Dorsal cup is narrowly bowl-shaped, with straight sides formed by the radials and a low, broadly expanding basal cup. The larger cup has a height of 13.7 mm., a breadth at the arms of 13.4 mm.; the smaller cup, a height of 11.8 mm. and a breadth at the arms of 11.3 mm. Measurements are taken from the larger specimen. The radials are long and comparatively narrow (average: height to facet, 9.6 mm.; breadth at top, 7.8 mm.; breadth at base, 7.2 mm.; breadth of facet, 4.5 mm.), one apparently narrower at the top. Radials almost flat along the lower margin, becoming more elevated and rounded in the median line, making the center of the facet rim the most elevated. The radials are sharply notched for the interradial tegminal plates. These are hexagonal in shape, an average one measuring 3.6 mm. wide by 2.2 mm. high; abutting with the two lateral faces on the first primibrachs, with the two upper faces apparently against large orals. The plate in the anal interradius is noticeably larger.

Two primibrachs, the first 4.5 mm. wide at the base and 2 mm. long; primaxil 4.4 mm. wide and 2.2 mm. long, the tip prolonged into a spine at least 1.7 mm. long. First two brachials of *arms* roughly hour-glass shaped as in *C. eriensis*, 2.1 mm. wide and 1.6 mm. long; followed by a shorter one of the same type and then about eleven short quadrangular plates. Thin wedge-shaped plates succeed these and in the distal portion of the arms the plates assume a distinct zigzag arrangement. Nowhere is the arm strictly biserial, so far as preserved. Pinnules borne from the first brachial on; stout and with remarkably long ossicles as in the genotype. The arms are not bifurcating above primaxils. They are preserved to a length of 42 mm. but could have been at least 60 mm. long.

The margins of the primibrachs and first large brachials show distinctly a coarse crenulation like that shown on the stem cicatrix. Some of the quadrangular and wedge-shaped brachials show it less distinctly. This character is also shown by the brachials of *eriensis*.

Seventeen millimeters of *column* are shown in the rock alongside the smaller specimen. It is composed of short columnals with strongly crenate margins, the articulating surfaces resembling that of the

cicatrix and with the same diameter. This is believed to be a piece of the column of this species, perhaps this specimen.

Ornamentation: Except for the long spine on the primaxil this species has practically no ornamentation. The plates which appear smooth are found to be finely granular under high magnification.

Horizon and locality: Hamilton (lower Moscow shale) beds, from the small stream two miles south of West Alden, Erie County, N. Y.

Remarks: The peculiar and diagnostic characters of the genus *Cyttarocrinus* are shown by the arms: two primibrachs and arms unbranched above this. *C. jewetti* is retained in this genus because it shows enough characters in common with *C. eriensis* to warrant its retention. The genus then contains one species with uniserial arms and another in which the brachials change from a uniserial arrangement in the proximal portion to a zigzag arrangement in the distal portion, a condition pointing the way to the biserial character of the arms of the later representatives of the Platycrinidae.

Order INADUNATA Wachsmuth and Springer

Botryocrinus crassus (Whiteaves)

(Plate XXVII, figure 3)

1887. *Homocrinus crassus* Whiteaves. Contr. Can. Pal. v. 1, pt. 2, (advanced sheets) p. 95; 1889, pl. 12, fig. 2.
 1889. *Homocrinus crassus* S. A. Miller. N. Amer. Geol. & Pal., p. 255.
 1893. *Botryocrinus crassus* Bather. Crin. Gotland, pt. I, p. 103.
 1898. *Botryocrinus crassus* Whiteaves. Contr. Can. Pal., v. 1, pt. 5, p. 375.
 1901. *Botryocrinus crassus* Shimer & Grabau. Bull. Geol. Soc. Amer., 13: 185.
 1906. *Botryocrinus crassus* Bather. Ottawa Naturalist, 20, No. 5: 101.
 1923. *Botryocrinus crassus* Goldring. N. Y. State Mus. Mem. XVI, pp. 365-367, pl. 47, figs. 7, 8.

B. crassus has hitherto been known only from the Hamilton beds near Thedford, Ontario. In the collection of Percy R. Powell of Niagara Falls, N. Y., is a partial dorsal cup, preserving the infrabasals and basals. The cup is bell-shaped. The flaring upper portion of the basals, due to very slight constriction at just about the middle, is well shown and the thick cup plates are all rounded toward the sutures.

The holotype shows slight traces of shagreen ornamentation on the posterior basal and anterior radial; the specimen under discussion shows this character very distinctly on all the infrabasals and basals.

Horizon and locality: From the Hamilton beds (Ludlowville: Wanakah member, *Demissa* beds), Highland Acres, Erie County, N. Y.

Poteriocrinus kopfi sp. nov.

(Plate XXVII, figures 4-11)

Species based upon a series of nine dorsal cups ranging in height from 4.4 mm. to 12.9 mm., all slightly higher than wide. Width at arm facets about two and a half times the width at the base.

Dorsal cup somewhat bell-shaped, swelling to the top of the basals where there is a slight constriction; expanding again from here to the radial facets. Cup plates thick and rounded toward the sutures, particularly in older specimens.

Infrabasals large, pentagonal, slightly higher than greatest width, the lower lateral faces the longer. Basals are the largest plates in the cup, height and greatest width about equal; hexagonal, except the two posterior ones which support the anal plates and are heptagonal. Radials shorter than the basals, width and greatest height about equal (5 mm. in typical plate of second largest specimen); height to facet considerably less (3.7 mm. in same plate). Anterior radial noticeably smaller. Facets for reception of primibrachs curved and occupying a little over two-thirds of the width of the radials. Radial large, larger than anal *x*; pentagonal, the three upper faces bordered by anal *x*, right tube plate and right posterior radial, two lower faces resting upon the posterior and right posterolateral basals. Anal *x* extends slightly above the upper line of the radials. Hexagonal, bordered at the left by the left posterior radial, at the right by the right tube plate and radial; below rests upon the posterior basal and above bears the middle and left tube plates which are followed in one specimen by a few roughly hexagonal tube plates.

Tegmen not preserved. The largest specimen shows the first large interradial plate, of about the size of the anal *x*.

Arms: Of the arms only the primibrachs are preserved in any of the specimens, two in the right posterior radius of the largest specimen, the second not axillary. Primibrachs quadrangular, twice as wide as high.

Column preserved for about 4 mm. in the largest specimen, less in two others; subpentangular, angles interradial. Columnals alternately thinner and thicker with rounded edges.

Ornamentation characteristic but not striking. Surface of all plates of dorsal cup finely papillose, a character not always well-preserved. Low rounded ridges extend along the length of the basals, branching to the radials, infrabasals and anals and creating three distinct groups of depressions along the sutures between basals, radials and infrabasals. Ridges and depressions conspicuous only in older specimens.

Cotypes in the collections of the Buffalo Museum of Natural Science (I. G. Reimann, collector), M. J. Kopf of Lancaster, N. Y., and Percy R. Powell of Niagara Falls, N. Y.

Horizon and locality: From the Hamilton beds (lower Moscow) Eleven Mile Creek, Darien, Genesee County, N. Y.; Moscow at White Creek, East Bethany, N. Y.; Moscow (Kashong member), tileyard at East Bethany, Genesee County.

Remarks: Specific name given in honor of one of the collectors, M. J. Kopf. The species bears the closest resemblance to *P. dignatus* Goldring from which it is distinguished by the ridges and papillose surface of the dorsal cup.

EXPLANATION OF PLATE XXV

Rhodocrinus insculptus sp. nov.

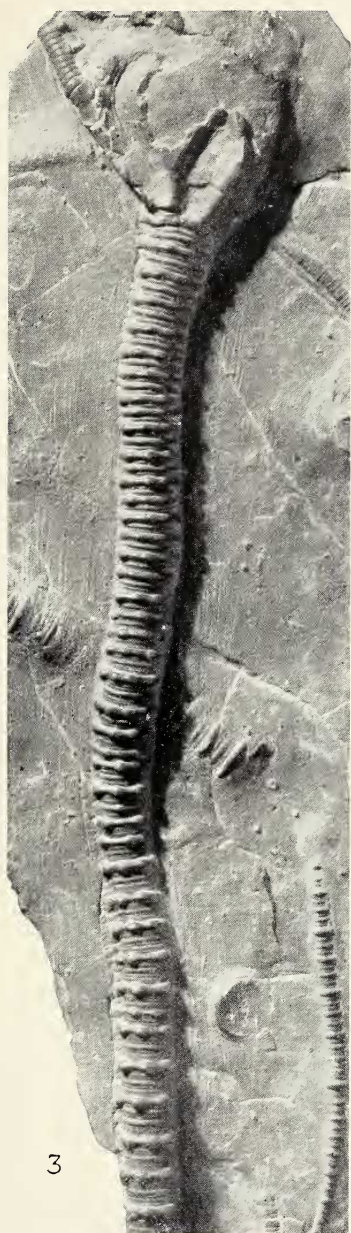
- FIG. 1. Baso-lateral view of dorsal cup, right anterolateral ray directed upward, $\times 2$. Tichenor (Ludlowville) or Lower Moscow; Railroad cut two miles east of Alden, Genesee Co., New York.

Melocrinus gracilis W. & Sp.

- FIG. 2. Lateral view of dorsal cup, showing the dorsal side of two arm trunks with parts of arms, $\times 1$. Anal interradius at right. Collection of Buffalo Museum of Science; I. G. Reimann, collector. Moscow (Kashong member); East Bethany, Genesee Co., New York.

Melocrinus howelli sp. nov.

- FIG. 3. Lateral view of dorsal cup showing part of an arm trunk and several centimeters of characteristic column, $\times 1$. Moscow; Bowen Creek, Genesee Co., New York.
- FIG. 4. Tegmen of another specimen referred to this species. $\times 1$. Moscow; Bowen Creek, Genesee Co., New York.



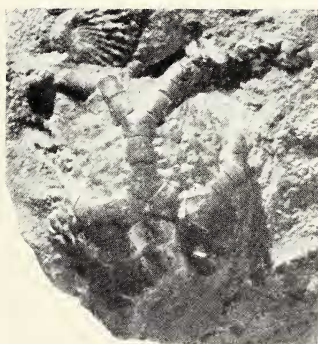
4



2



1



EXPLANATION OF PLATE XXVI

Melocrinus powelli sp. nov.

- FIG. 1. Arm trunk referred to this species. Type No. $\frac{43571}{1}$ in New York State Museum, $\times 1$. Moscow; Cashong Creek, Bellona, Yates Co., New York.

Gilbertocrinus spinodosus sp. nov.

- FIG. 2. Basal view showing heavy spines on radials, strong tubercle on primary anal interbrachial and wide and probably deep basal cavity. $\times 1\frac{1}{2}$. Collection of Buffalo Museum of Science; E. Reinhard, collector.
- FIG. 3. Tegmen of same, $\times 1\frac{1}{2}$.
- FIG. 4. Lateral view (right anterior interradius) of same, showing nodose plates with radiating ridges, $\times 1\frac{1}{2}$. Ludlowville (Tichenor); Eighteen Mile Creek, Erie Co., New York.

Gilbertocrinus multicalcaratus sp. nov.

- FIG. 5. Posterior view showing large spine on the first anal plate, $\times 1$.
- FIG. 6. Basal view of same showing spines on the radials and first anal plate, $\times 1$. Moscow (Kashong member); East Bethany, Genesee Co., New York.

Gennaecorinus similis sp. nov.

- FIG. 7. Basal view showing projecting basals and ornamentation, $\times 2$.
- FIG. 8. Left posterolateral view, anal interradius at right, $\times 2$. Lower Moscow; Railroad cut two miles east of Alden, Genesee Co., New York.